

## ABSTRACT OF THE DISCLOSURE

A three dimensional photonic crystal and layer-by-layer processes of fabricating the photonic crystal. A substrate is exposed to a plurality of first microspheres made of a first material, the first material being of a type that will bond to the templated substrate and form a self-passivated layer of first microspheres to produce a first layer. The first layer is exposed to a plurality of second microspheres made of a second material, the second material being of a type that will bond to the first layer and form a self-passivated layer of second microspheres. This layering of alternating first and second microspheres can be repeated as desired to build a three dimensional photonic crystal of desired geometry. Charged polymers such as polyelectrolyte coatings can be used to create the bonds.